2

INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

253rd Combat Communications Group
and
267th Combat Communications Squadron

Wellesley Air National Guard Station
Massachusetts Air National Guard
Wellesley, Massachusetts

February 1991

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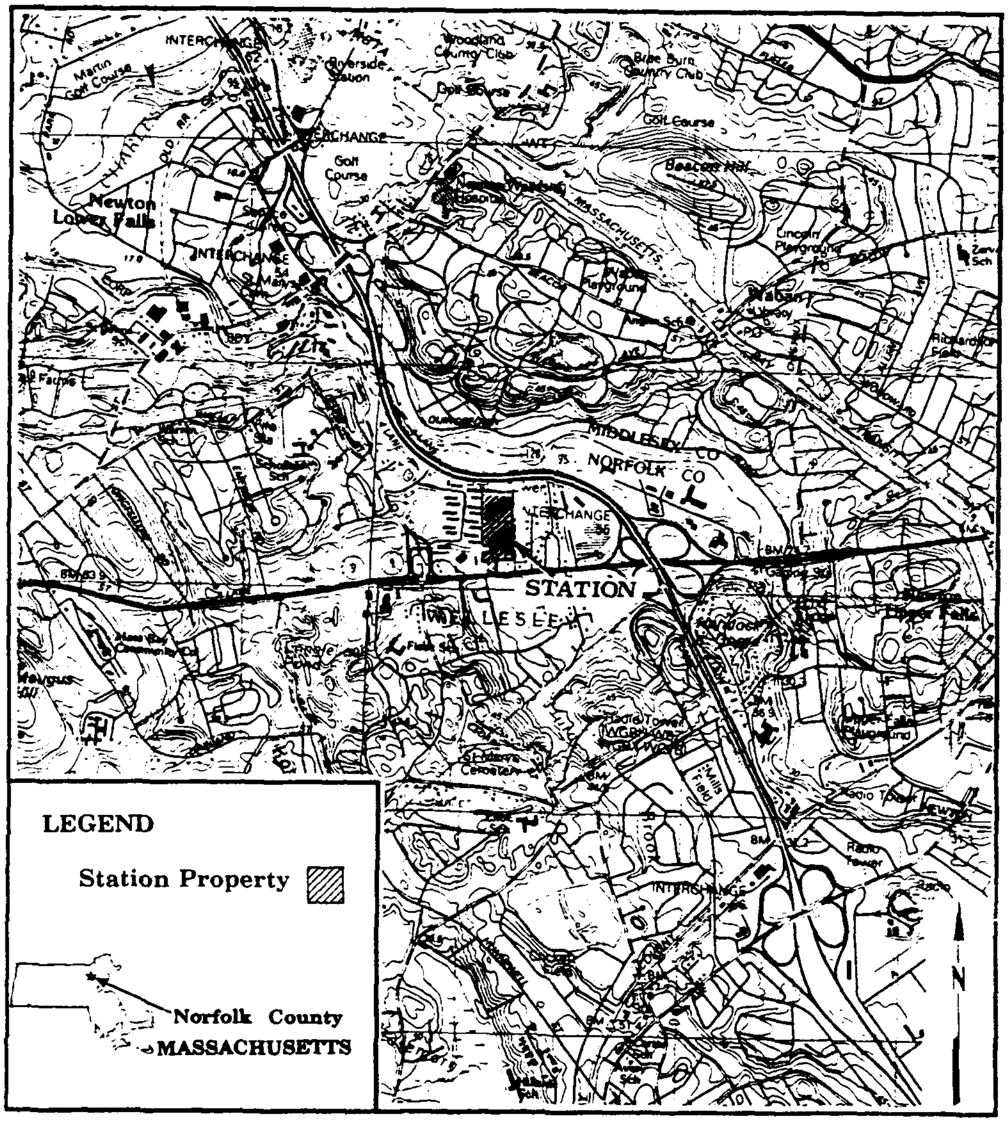

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Preliminary environmental assessment for the Wellesley Air National Guard Station, as part of the Installation Restoration Program. The report reflects data gathered from records review, interviews, and a site visit. No sites were identified as potentially contaminated and no further action will be recommended for the Station.

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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

253rd COMBAT COMMUNICATIONS GROUP
AND
267th COMBAT COMMUNICATIONS SQUADRON
WELLESLEY AIR NATIONAL GUARD STATION
MASSACHUSETTS AIR NATIONAL GUARD
WELLESLEY, MASSACHUSETTS

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ACRONYM LIST

AGE	Aerospace Ground Equipment
AMSL	Above Mean Sea Level
ANG	Air National Guard
CCG	Combat Communications Group
CCS	Combat Communications Squadron
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DoD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EO	Executive Order
EPA	Environmental Protection Agency
FR	Federal Register
FS	Feasibility Study
HAS	Hazard Assessment Score
HAZWRAP	Hazardous Waste Remedial Actions Program
IRP	Installation Restoration Program
JP-4	Jet Fuel
MOGAS	Automotive Gasoline
NGB	National Guard Bureau
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
OWS	Oil/Water Separator
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyls
PL	Public Law
POL	Petroleum, Oil, and Lubricant
RCRA	Resource Conservation and Recovery Act of 1976
R&D	Research and Development
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SciTek	Science & Technology, Inc.
SI	Site Investigation
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank
UTC	Unit Type Code

EXECUTIVE SUMMARY

A. INTRODUCTION

Science & Technology, Inc. (SciTek) was retained to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 253rd Combat Communications Group (CCG) and the 267th Combat Communications Squadron (CCS), Wellesley Air National Guard (ANG) Station [hereinafter referred to as the Station], Massachusetts Air National Guard, located in the city of Wellesley, Massachusetts. For the purpose of this document, the Station shall include the total area leased by the 253rd CCG and the 267th CCS at Wellesley, Massachusetts.

The PA included the following activities:

- an on-site visit, including interviews with a total of six persons familiar with Station operations, and field surveys by SciTek representatives during the week of May 7-10, 1990;
- acquisition and analysis of information on past hazardous materials use, waste generation, and waste disposal at the Station;
- acquisition and analysis of available geological, hydrological, meteorological, and environmental data from federal, state, and local agencies; and
- the identification and assessment of sites on the Station that may have been contaminated with hazardous wastes.

B. MAJOR FINDINGS

The 253rd CCG and the 267th CCS have used hazardous materials and generated small amounts of wastes in mission-oriented operations and maintenance at the Station since 1960.

Operations that have involved the use of hazardous materials and the disposal of hazardous wastes include vehicle maintenanceand aerospace ground equipment (AGE) maintenance. The hazardous wastes disposed of through these operations include varying quantities of petroleum-oil-lubricant (POL) products, acids, paints, thinners, strippers, and solvents.

The field surveys and interviews resulted in no sites being identified that exhibit the potential for contaminant presence and migration.

C. CONCLUSIONS

It has been concluded there are no sites where a potential for contaminant presence exists.

D. RECOMMENDATIONS

No further work under the IRP is recommended.

I. INTRODUCTION

A. Background

The 253rd Combat Communications Group (CCG) and the 267th Combat Communications Squadron (CCS), Wellesley Air National Guard (ANG) Station [hereinafter referred to as the Station] is located in Wellesley, Massachusetts. Both units have been active at the Station since 1960. Both the past and current operations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of resultant wastes, the National Guard Bureau (NGB) has implemented the Installation Restoration Program (IRP).

The IRP is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on Department of Defense (DoD) installations and
- o Control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act (RCRA) of 1976 and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Public Law (PL) 96-510), commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via an Executive Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 (December 11, 1981), which reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the Environmental Protection Agency (EPA) Superfund programs were essentially the same, differences in the definition of program activities and lines of authority resulted in some confusion between DoD and state/federal regulatory agencies. These difficulties were rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On January 23, 1987, Presidential Executive Order EO 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes effected by SARA included the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan [40CFR300], listing on the National Priorities List, and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the EPA under Superfund authority.

- Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program. This was accomplished by adding Chapter 160, Sections 2701-2707 to Title 10 United States Code (10 USC 160).

- SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the EPA under their Superfund authority.

As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

- **Preliminary Assessment**

  The Preliminary Assessment (PA) process consists of personnel interviews and a records search designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, public welfare, or the environment. Previously undocumented information is obtained through the interviews. The records search focuses on obtaining useful information from aerial photographs; Station plans; facility inventory documents; lists of hazardous materials used at the Station; Station subcontractor reports; Station correspondence; Material Safety Data Sheets; federal/state agency scientific reports and statistics; federal administrative documents; federal/state records on endangered species, threatened species, and critical habitats; documents from local government offices; and numerous standard reference sources.

- **Site Inspection/Remedial Investigation/Feasibility Study**

  The Site Inspection consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the PA. An expanded Site Inspection has been designed by the Air National Guard as a Site Investigation. The Site Investigation (SI) will include additional field tests and the installation of monitoring wells to provide data from which site-specific decisions regarding remediation actions can be made. The activities undertaken during the SI fall into three distinct categories: screening activities, confirmation and delineation activities, and optional activities. Screening activities are conducted to gather preliminary data on each site. Confirmation and delineation activities include specific media sampling and laboratory analysis to confirm either the presence or the absence of contamination, levels of contamination, and the potential for contaminant migration. Optional activities will be used if additional data is needed to reach a decision point for a site. The general approach for the design of the SI activities is to sequence the field activities so that data are acquired and used as the field investigation progresses. This is done in order to determine the absence or presence of contamination in a relatively short period of time, optimize data collection and data quality, and to keep costs to a minimum.

  The Remedial Investigation (RI) consists of field activities designed to quantify and identify the potential contaminant, the extent of the contaminant plume, and the pathways of contaminant migration.

  If applicable, a public health evaluation is performed to analyze the collected data. Field tests, which may necessitate the installation of monitoring wells or the collection and analysis of water, soil, and/or sediment samples, are required. Careful documentation and quality control procedures in accordance with CERCLA/SARA guidelines ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates, and direction of contaminant migration. The findings from these studies result in the selection of one or more of the following options:

  1. **No Further Action** - Investigations do not indicate harmful levels of contamination that pose a significant threat to human health or the environment. The site does not warrant further IRP action, and a Decision Document will be prepared to close out the site.

  2. **Long-Term Monitoring** - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect the possibility of future problems.

3. **Feasibility Study** - Investigation confirms the presence of contamination that may pose a threat to human health and/or the environment, and some sort of remedial action is indicated. The Feasibility Study (FS) is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on an installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action with concurrence by state and/or federal regulatory agencies.

- **Remedial Design/Remedial Action**

  The Remedial Design involves formulation and approval of the engineering designs required to implement the selected remedial action. The Remedial Action is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in situ biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the remedial actions have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

- **Research and Development**

  Research and Development (R&D) activities are not always applicable for an IRP site but may be necessary if there is a requirement for additional research and development of control measures. R&D tasks may be initiated for sites that cannot be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

- **Immediate Action Alternatives**

  At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate action, such as limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply may suffice as effective

control measures. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. Purpose

The purpose of this IRP PA is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on Station property.

The potential for migration of hazardous contaminants was evaluated by visiting the Station, reviewing existing environmental data, analyzing Station records concerning the use of hazardous materials and the generation of hazardous wastes, and conducting interviews with current Station personnel who had knowledge of past waste disposal techniques and handling methods. Pertinent information collected and analyzed as part of the PA included a records search of the history of the Station; the local geological, hydrological, and meteorological conditions that might influence migration of contaminants; and ecological settings that indicate environmentally sensitive conditions.

C. Scope

The scope was limited to the identification of sites at or under primary control of the Station and evaluation of potential receptors. The PA included:

- o an on-site visit during the week of May 7-10, 1990;
- o acquisition of records and information on hazardous materials use and waste handling practices;
- o acquisition of available geological, hydrological, meteorological, land use and zoning, critical habitat, and related data from federal and state agencies;
- o a review and analysis of all information obtained; and
- o preparation of a summary report to include recommendations for further action.

The subcontractor effort was conducted by the following Science & Technology, Inc. (SciTek) personnel: Mr. Tracy C. Brown, Environmental Analyst; Mr. Charles T. Goodroe, Environmental Protection Specialist; and Mr. Stephen

B. Selecman, Geologist/Hydrogeologist. Mr. Michael Minior of the NGB is Project Officer for this Station and participated in the overall assessment during the week of the station visit. Mr. Steven R. Fleming of the Hazardous Waste Remedial Actions Program (HAZWRAP) also participated in the station visit.

The point of contact at the Station was Lieutenant Colonel Alan L. Cowles. Mr. William Sterling was the representative from their civil engineering support facility located at Otis Air National Guard Base, Massachusetts.

D. Methodology

The PA began with a visit to the Station to identify all operations that may have utilized hazardous materials or may have generated hazardous wastes. Figure I.1 is a flow chart of the PA methodology.

Six present Station employees familiar with the various operating procedures were interviewed. These interviews were conducted to determine those areas where waste materials (hazardous or nonhazardous) were used, spilled, stored, disposed of, or released into the environment. The interviewees' knowledge and experience with Station operations averaged 20 years and ranged from 9 to 30 years.

Records contained in the Station files were collected and reviewed to supplement the information obtained from the interviews.

Detailed geological, hydrological, meteorological, and environmental data for the area were obtained from the appropriate federal, state, and local agencies. A listing of agency contacts is included as Appendix A.

After a detailed analysis of all the information obtained, it was concluded that the Station has no sites potentially contaminated with hazardous wastes. Under the IRP program, when sufficient information is available, sites are numerically scored and assigned a Hazard Assessment Score (HAS) using a hazard assessment rating methodology. However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather, may indicate a lack of data.

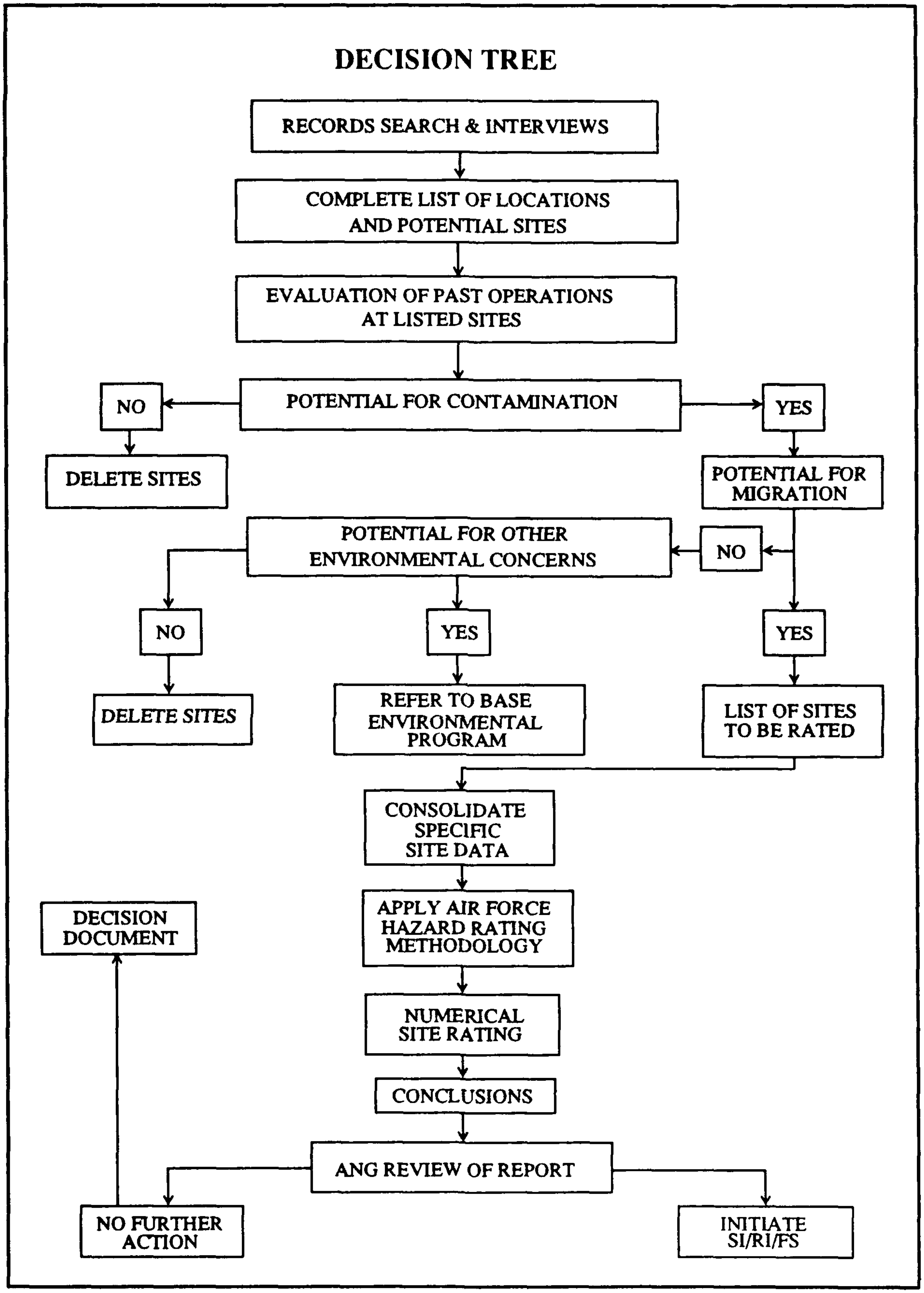


Figure I.1

Preliminary Assessment Methodology Flow Chart

II. INSTALLATION DESCRIPTION

A. Location

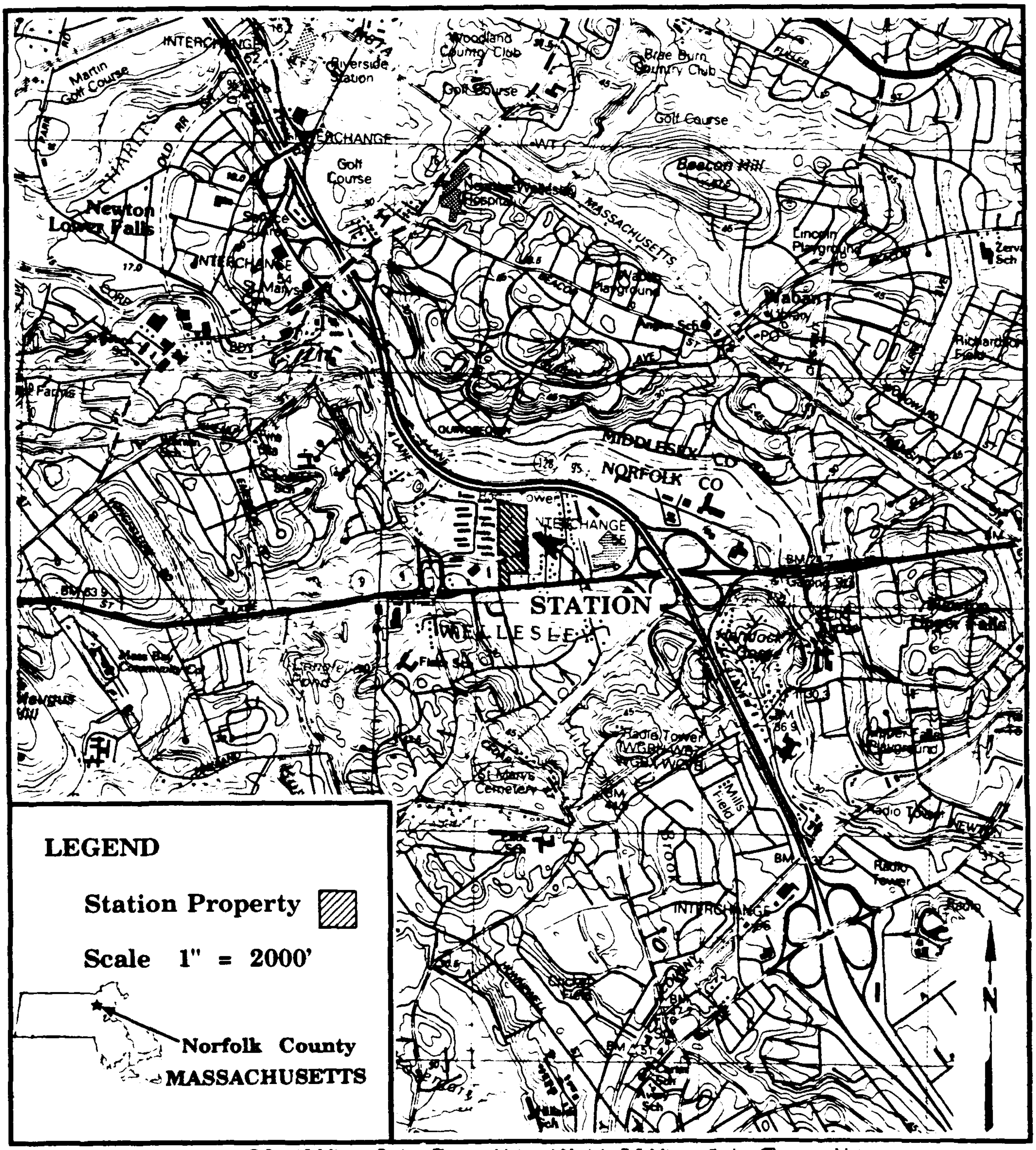
The Station is located at 114 Minuteman Lane off State Route 9 within the city of Wellesley and county of Norfolk, Massachusetts. It is located on a flat parcel of property with declared inland wetlands consuming approximately 40 percent of the total area. Elevation of the Station is 70 feet above mean sea level (AMSL). Figure II.1 illustrates the location and boundaries of the Station.

The Station occupies a total of 7.1 acres and is completely fenced. The one permanent structure on the property houses both the 253rd CCG and the 267th CCS units and all their respective operations. The population of the Station during the week numbers 50 members. Unit Training Assembly occurs one weekend per month. The Station population during this weekend is 260 members.

B. Organization and History

The Station is occupied by two organizations. The 253rd CCG is the Group Headquarters element providing administrative support and guidance to its units. The 267th CCS is the functional unit assigned to the 253rd CCG. When the facility building was completed in June 1960, both units moved onto the property now known as the Wellesley ANG Station. In 1966, the east wing of the building was added to accommodate increases in training and mission requirements. In 1976, the 267th CCS experienced an increase in their mission and a corresponding increase in equipment. In 1983, two additions were constructed: the Auto Maintenance Shop and the Support Equipment Shop. In addition, oil/water separators and an improved storm drainage system were installed behind the facility. Prior to the construction of the Station, the property was unimproved and believed to be farmland.

The 267th CCS is the primary generator of waste materials, whereas the 253rd CCG provides a management function and possesses no maintenance capabilities. Both units moved from the Fiske School on Cedar Street in Wellesley at the same time (June 1960). The 267th CCS was originally organized as the 101st Communications Squadron and assigned to the 67th Fighter Wing. On July 1, 1952, it was redesignated the 267th Communications Squadron. Over the years, the unit has experienced several name changes but always retained its numerical designator. The mission of the 267th CCS is to deploy, operate, and maintain communications-electronics unit type code (UTC) packages to support contingencies and provide communications-electronics support for operational commands once the UTCs have been



SOURCE: USGS, So. Boston, 7.5 x 15 Minute Series (Topograhic) and Natick, 7.5 Minute Series (Topographic).

Figure II.1

Location Map of the Wellesley Air National Guard Station

employed and made operational. The scope of their mission has not changed significantly over the years. Mission improvements have been made through advancements in technology.

The 253rd CCG was organized after the Korean War. Since that time, it has remained collocated with the 267th CCS. The unit has been redesignated several times over the years; however, like the 267th CCS, it has retained its numerical designator. The mission of the 253rd CCG is to provide a staff element for management of communications-electronics personnel and equipment when deployed in support of war mobilization plans, contingencies, and unit mission assignments. Their mission has not changed significantly except for equipment improvements.

The facility structure is a large one-story building housing the Headquarters and Administrative elements of both units along with all their respective shops. The 267th CCS performs motor vehicle and AGE maintenance in recent additions to the west side of the building. There are no other permanent structures on the property. The northern portion of the Station is wetlands and is unusable.

The property has always supported a maintenance function because of the mission of the 267th CCS. The repair and servicing of motor vehicles and AGE items have taken place on the property since the ANG took possession. Underground storage tanks (USTs) for diesel oil and jet fuel (JP-4) are on the property. There are four oil/water separators (OWSs) that aid in the prevention of property degradation.

Materials recognized as hazardous have been generated on this property since the establishment of the Station. With the awareness of hazardous materials and the recognition of their impact on the environment, acceptable disposable practices and procedures have evolved. The majority of hazardous wastes are now collected and disposed of through contractors and the Defense Reutilization and Marketing Office (DRMO).

III. ENVIRONMENTAL SETTING

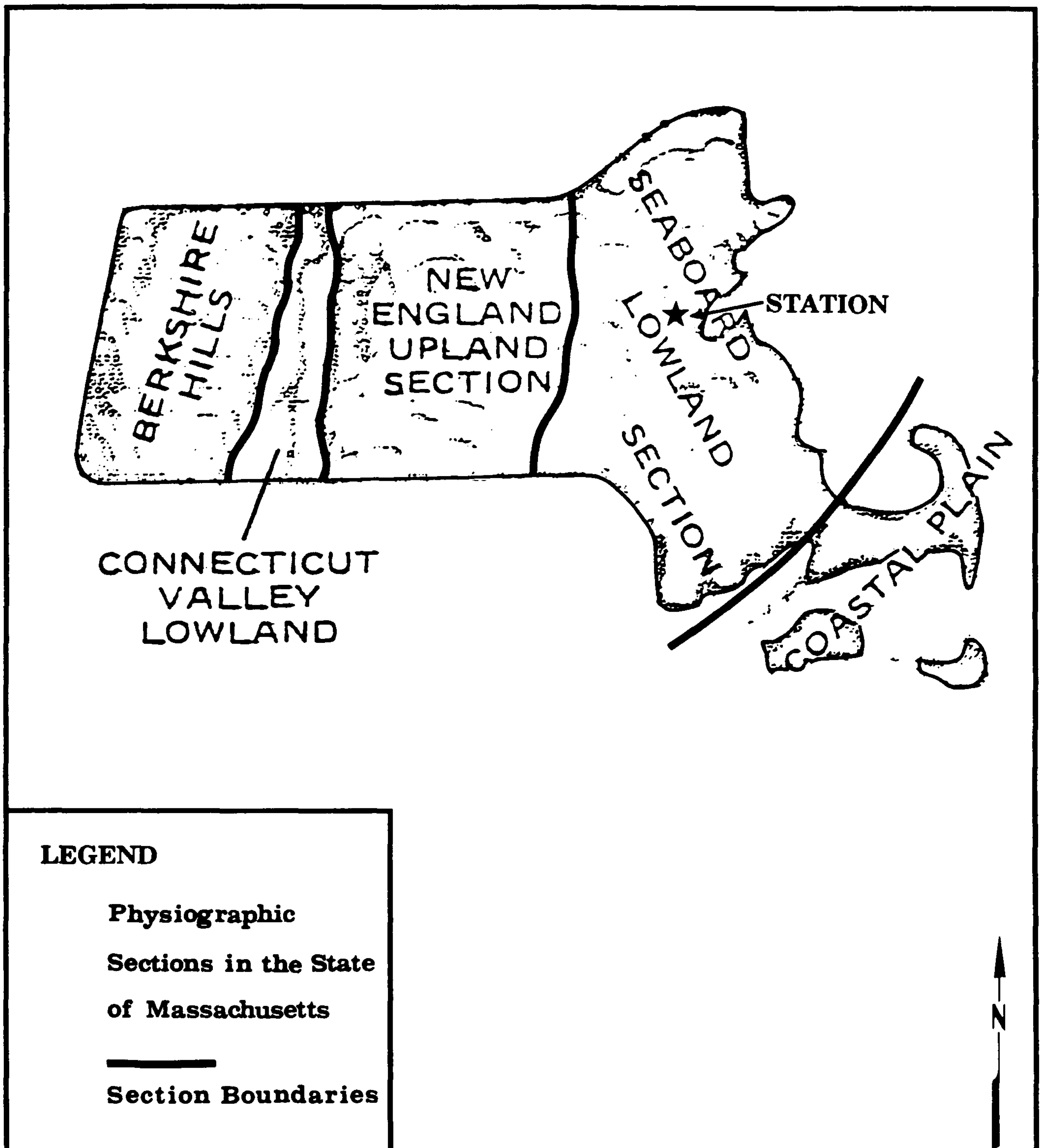
A. Meteorology

The following climatological data is largely derived from the National Climatic Data Center, Asheville, North Carolina, and is published in the Soil Survey of Norfolk and Suffolk Counties, Massachusetts (United States Department of Agriculture (USDA): Soil Conservation Service, 1989). Norfolk County is characterized by moderate summers, moderately cold winters, and a fairly even distribution of precipitation. The total average annual precipitation, based on a 24-year record (1957-1981), is 45.14 inches, and it ranges from an average monthly high of 4.62 inches in December to an average monthly low of 3.09 inches in June. By calculating net precipitation according to the method outlined in the Federal Regulations CERCLA Pollution Contingency Plan (United States Environmental Protection Agency, 55 FR 8813, Subpart K, March 8, 1990), a net precipitation value of 19.14 inches per year is obtained. The heaviest rainfall during the recording period was 4.75 inches and occurred at West Medway on September 12, 1960. The 1-year, 24-hour rainfall for the area is approximately 2.7 inches. Thunderstorms occur on an average of 19 days a year, mostly in the summer. Normal snowfall totals approximately 46 inches a year, and an average of 43 days a year there is at least 1 inch of snow or more on the ground. The average annual temperature for the 24-year reporting period (1957-1981) was 48.2°F. The average monthly temperature ranged from 71.0°F in July to 24.4°F in January. Prevailing wind direction is from the southwest. Average windspeed is highest in the spring at 14 miles per hour.

B. Geology

Massachusetts is divided into the New England and Coastal Plain physiographic provinces. The southeastern peninsula and outer islands of Massachusetts are included in the Coastal Plain province while the remainder of the State exists in the New England province (Figure III.1). The New England province is further subdivided into sections (Fenneman, 1938); the Station is located in the eastern most of these sections, termed the Seaboard Lowland.

The Seaboard Lowland section is a coastal strip that is characterized by glacial topography with relatively moderate relief. Topographic relief generally increases to the west toward the New England Upland section (Frimpter, 1984). Surface elevations are commonly less than 500 feet AMSL in the Seaboard Lowland section and span from 60 feet to 250 feet AMSL in the vicinity of the



SOURCE: Frimpter, M. H., Massachusetts Ground-Water Resources, USGS, Water Supply Paper #2275, 1984.

Figure III.1

Physiographic Map of Massachusetts

Station. Specifically, the Station is situated along the Charles River where the surface elevation ranges between 64 feet and 72 feet AMSL.

The geology of the Seaboard Lowland section is very complex because of the highly faulted and folded bedrock (La Forge, 1932). In addition, glaciation has altered many of the existing land forms, and glacial deposits commonly cover the surface; therefore, outcrops of bedrock are sparse. The existing bedrock consists of igneous, metamorphic, and sedimentary rocks that range in age from Precambrian to Carboniferous (Nelson, 1974). Thrust faults and normal faults are the dominant structural features and were created through tectonic events. Although major faults are oriented perpendicular to the regional strike, the general structural grain is northeast, and regional dip is to the northwest (La Forge, 1932). Displacement along fault planes ranges from a fraction of an inch to several miles (Nelson, 1975).

A major northeast trending fault named the Basin Fault exists approximately 1.5 miles northwest of the Station. The area southeast of this fault is termed the Boston Basin, and it consists of younger bedrock of a comparably different lithology than the area northwest of the fault. The rocks of the Boston Basin are Upper Silurian to Carboniferous in age and are volcanic and sedimentary in origin (Nelson, 1975). Specifically, the bedrock in the vicinity of the Station is grouped as the Mattapan Volcanic Complex and the Boston Bay Group. A detailed lithologic description for the members of these groups is shown on Figure III.2A.

Based on current geologic mapping, the bedrock underlying the Station is the upper member of the Boston Bay Group and is termed the Cambridge Slate. The Roxbury Conglomerate is mapped as the bedrock occurring immediately adjacent to the southern boundary of the Station. The Cambridge Slate and the Roxbury Conglomerate are sedimentary rocks that have been altered through tectonic and hydrothermal processes (Nelson, 1975). It is not likely that either formation possesses any significant porosity or permeability except where fracturing occurs. An east-west trending fault that accounts for the abutment of these formations can be found at this location. The occurrence of the fault and bedrock is based on adjacent outcrops (Kaye, 1980); however, because of the sparse nature of the bedrock outcrops, the existence of the fault and the bedrock is inferred. Therefore, it is possible that the Station is underlain by either or both the Cambridge Slate and the Roxbury Conglomerate.

The surface material concealing the bedrock is primarily composed of Pleistocene glacial deposits and, to a lesser degree, postglacial Holocene deposits (Figure III.2B). Glacial ice generally moved across the area in a south to southeast direction depositing a thin veneer of glacial drift of varying thickness. Glacial deposits primarily consist of nonstratified till, stratified glacial-lake deposits, and stratified glacial-stream deposits. Nonstratified till

BOSTON BAY GROUP (CARBONIFEROUS TO UPPER SILURIAN)

CAMBRIDGE SLATE-Greenish to brownish-gray thin bedded argillite containing quartz, feldspar, sericite, and opaque minerals; much of the matrix is fine, unidentifiable material with thin wispy streaks of chlorite; some intercalated thin fine-grained greenish-gray beds consisting principally of chlorite, epidote, and sericite; estimated to be 370 meters thick in quadrangle.

BRIGHTON MELAPHYRE-Bluish- to dark-greenish-gray basalt and andesite flows and tuffs. Basalt is fine-grained and amygdaloidal, commonly massive and locally pillowed, consisting of phenocrysts of sericitized plagioclase and chloritized hornblende set in a fine-grained groundmass of tiny plagioclase laths, some sericite, chlorite, epidote, some plagioclase fragments and crystals in a fine-grained matrix of plagioclase sericite, epidote, calcite, chlorite, and fine-textured unidentified faintly birefringent material. Andesite flows contain small phenocrysts of sericitized plagioclase, minor chloritized mafic minerals in fine-grained groundmass rich in tiny plagioclase laths, mostly with a pilotaxitic texture. Crystal tuffs characterized by numerous small crystals and fragments of plagioclase in a fine-grained matrix rich in plagioclase and unidentified very fine-grained material. Contains some minor interleaved very fine ash and slate. Bedding ranges from indistinct to conspicuous and cleavage is locally prominent. Estimated to be about 1070 meters thick in quadrangle.

ROXBURY CONGLOMERATE-Pale-red to pink-gray coarse cobble conglomerate, cobbles well-rounded, ellipsoidal to disc and tabular shapes, and variable in size and lithology; in places angular rock fragments are present. In eastern part of quadrangle about 42 percent of the cobbles are Westboro Quartzite; 25 percent are Dedham Granodiorite and granite; 10 percent are red felsic lava, probably of Lynn Volcanic Complex; 10 percent are siltstone and shale; 6 percent are gray volcanic rocks of Mattapan Volcanic Complex; and 7 percent are fin-grained andesite lava of the Mattapan or Brighton volcanic units; farther west volcanic component increases and cobbles are less well-rounded. Matrix, which appears to be high in tuffaceous material, is medium-grained containing quartz, feldspar, epidote, and chlorite, some small lithic fragments, and reddish-purple clay, massive to poorly bedded. Yellowish-gray sandstone that is rarely crossbedded and purple-gray silty shale or shale are intercalated with conglomerate; estimated to be at least 1130 meters thick in quadrangle.

MATTAPAN VOLCANIC COMPLEX (CARBONIFEROUS TO UPPER SILURIAN)

LAHARIC MEMBER-Pale- to deep-red lahar or mud flow containing numerous lithic angular volcanic clasts 6 mm to 40 mm long enclosed in a largely deep-red weakly birefringent aphanitic matrix rich in hematite; locally matrix is rich in quartz and sericitized feldspar, chlorite, and epidote; a few impure reddish to pinkish-gray sandstone beds containing a few rock fragments intercalated with the lahar; maximum thickness 335 meters.

INTERMEDIATE VOLCANIC MEMBER-Bluish- to greenish-gray fine-grained andesite with small phenocrysts of sericitized plagioclase, quartz, and minor chloritized mafic minerals in aphanite to very fine grained groundmass of tiny plagioclase laths, commonly with trachytic to pilotaxitic texture; epidote clots and veinlets common. Bluish-gray to reddish-brown volcanic breccia in which fragments vary from 2-30 cm in length and consist of a variety of volcanic arock types in a matrix of quartz, crystal tuffs, in which matrix commonly has aggregates of tiny granules of epidote, sericitized plagioclase, some quartz, and finely disseminated magnetite; deep-red to purple-red lahar with heterogeneous mixture of poorly sorted volcanic rock fragments, fragmented crystals of plagioclase and some quartz embedded in deep-red to purple-red fine-grained to aphanitic matrix of tiny crystal fragments and microcrystalline material high in tiny particles of hematite; locally epidote and calcite common; approximately 850 meters thick in quadrangle.

SILICEOUS PYROCLASTIC MEMBER- Light-gray to light-pinkish-gray to greenish-gray siliceous pyroclastic rock that is mostly crystal tuff and some highly fragmented lapilli tuff; characterized by crystals of quartz, some of which are resorbed, and plagioclase embedded in fine-grained to aphanitic matrix of sericitized plagioclase, quartz, chlorite, epidote, magnetite, and rarely pyrite; contains some pale-reddish-purple lava fragments. In places, rock is fragmental; elsewhere appears massive; only rarely are faint flow lines observed. Columnar jointing is well developed locally. Approximately 760 meters thick in quadrangle.

Upper Silurian

SOURCE: USGS, Bedrock Geologic Map of the Natick Quadrangle, Middlesex and Norfolk Counties, Massachusetts, G Q-1208, 1975.

Figure III.2A

Generalized Bedrock

Stratigraphic Column of the Area

af ARTIFICIAL FILL and GRADED AREAS - Partly cut and partly filled.

Qs SWAMP DEPOSITS (HOLOCENE) - Brownish-black muck, peat, silt, and sand. Overlies alluvium, river-terrace deposits, till, lacustrine, and ice-contact deposits.

Qal ALLUVIUM (HOLOCENE) - Pale-brown, light-brown, pale-yellowish-brown and grayish-orange, poorly stratified sand, silt, and gravel with minor clay.

Qrt RIVER TERRACE DEPOSITS (HOLOCENE) - Pale-brown, light-tan, yellow-brown gravel, sand, and silt along the Charles River.

Qsg SAND and GRAVEL UNDIFFERENTIATED (HOLOCENE and PLEISTOCENE) - Yellowish-brown stratified sand and gravel of varied texture.

GLACIAL-STREAM DEPOSITS (WISCONSIN) - Light-yellowish-brown moderately well sorted and stratified gravel, coarse pebbly sand, and medium sand.

Qo3 Outwash associated with Stony Brook drainage and Charles River near Waltham

Qo2 Outwash on west side of Reeves Hill

Qol High-level outwash in north-central part of quadrangle.

GLACIAL-LAKE and GLACIAL STREAM DEPOSITS (WISCONSIN) - Light-yellowish-brown to gray gravel, sand, and silt laid down in or graded to the various lake levels of Lakes Charles and Sudbury

DEPOSITS of LAKE SUDBURY

Qls5 Low level of Cherry Brook stage

Qls4 High level of Cherry Brook stage

Qls3 Low level of Weston stage

Qls2 High level of Weston stage

Qls1 Wayland stage

DEPOSITS of LAKE CHARLES

Qlc4 Morses Pond stage

Qlc3 Cochituate stage

Qlc2 East Natick stage

Qlc1 Sherborn stage

ICE-CONTACT DEPOSITS (WISCONSIN) - Light-yellowish-brown generally poorly sorted stratified gravel and sand of varying sizes.

Qc4 Formed when stagnant ice mass was southeast of Wayland

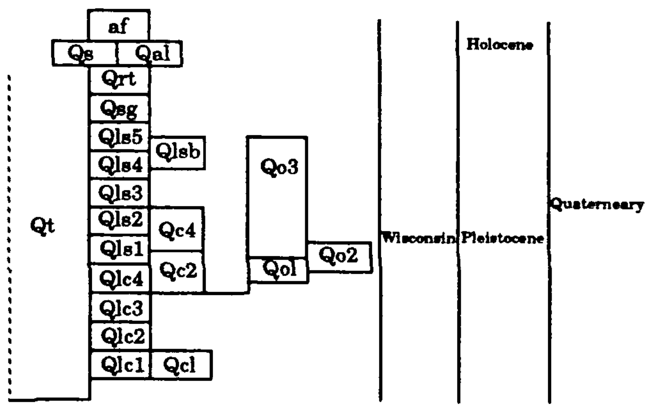
Qc3 Formed when stagnant ice mass was in eastern part of map

Qc2 Formed when stagnant ice mass was in vicinity of Dudley Pond

Qc1 Formed when stagnant ice mass was near Sherborn

Qlsb LAKE-BOTTOM DEPOSITS (WISCONSIN) - Yellowish-brown to grayish-orange well-sorted and stratified fine sand and silt.

Qt TILL (WISCONSIN) - Light-gray to greenish-gray poorly stratified and poorly sorted heterogenous mixture of gravel boulders, cobbles, pebbles, sand and silt.



SOURCE: USGS, Bedrock Geologic Map of the Natick Quadrangle, Middlesex and Norfolk Counties, Massachusetts, G Q-1208, 1975.

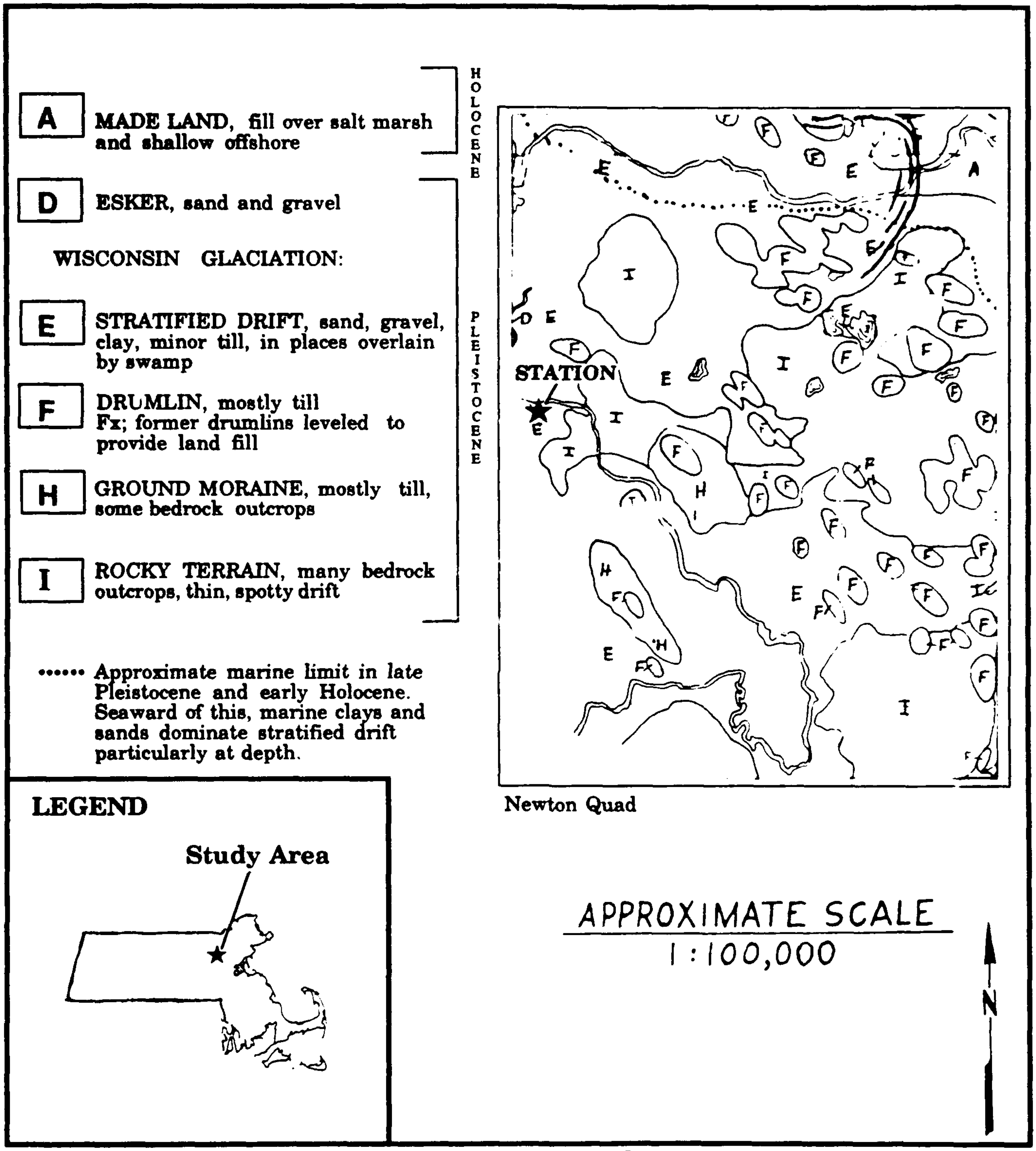
Figure III.2B

Generalized Surficial Material Stratigraphic Column of the Area

is widespread throughout the area and covers a large part of the hills. Stratified glacial deposits are generally younger and exist at lower topographic levels than the nonstratified deposits. The stratified material was deposited by glacial meltwater derived from deglaciation (Nelson, 1974). Postglacial material generally consists of stream-terrace deposits, alluvium, and swamp deposits (Nelson, 1974). Generally, postglacial deposits are much less extensive in occurrence and are limited to topographic lowlands.

Available surficial geologic mapping by Kaye, 1978, indicates the Station is underlain by stratified glacial drift (Figure III.3). More specifically, surficial mapping by Nelson, 1974, suggests the drift at the Station location is composed of ice-contact deposits. Ice-contact deposits generally consist of poorly sorted and stratified gravel and sand of various sizes. Deposition of this material was in conjunction with melt water streams that flowed from adjacent stagnant ice fronts. These deposits are gradational to glacial-lake deposits that exist to the south. The thickness of the surficial deposits is very irregular throughout the area (Nelson, 1974). At the Station location, the total thickness of surficial material is projected at approximately 75 feet (Walker et al, 1977). However, the relative thickness of glacial to postglacial deposits is not known.

The soils overlying the surface material at the Station are the Merrimac-Urban Land Complex (MnB) and the Swansea Muck (Sw). The MnB occupies the southeastern two-thirds of the Station property while the Sw is found along the western boundary and in the northern one-third of the property. MnB soils are deep (60 inches), nearly level, somewhat excessively drained soils of the Merrimac series that have been altered through urban development. These soils are derived from water-sorted, sandy glacial material associated with glacial outwash plains, terraces, and kames. Surface soil and the subsoil consist of friable fine sandy loam and sandy loam with moderately rapid permeability (2.00 to 6.00 inches per hour or 1.41×10^{-3} to 4.24×10^{-3} cm/sec). The substratum is composed of stratified sand and gravel, and this zone has rapid permeability (6.00 to 20.00 inches per hour or 4.24×10^{-3} to 1.41×10^{-2} cm/sec). Sw soils are deep (60 inches), nearly level, very poorly drained organic soils. They are associated with depressions and low flat areas such as the wetlands that occupy the northern portion of the Station property. These soils are formed in black, highly decomposed organic material and have moderate (0.63 to 2.00 inches per hour or 4.45×10^{-4} to 1.41×10^{-3} cm/sec) or moderately rapid (2.00 to 6.00 inches per hour or 1.41×10^{-3} to 4.24×10^{-3} cm/sec) permeability. The information pertaining to soils contained in the text was derived from the Norfolk and Suffolk Counties Massachusetts Interim Soil Report (United States Department of Agriculture (USDA): Soil Conservation Service, Second Edition, May, 1987) and the Soil Survey of Norfolk and Suffolk Counties, Massachusetts (United States Department of Agriculture (USDA): Soil Conservation Service, September, 1989). A record of available soil borings can be found in Appendix B.



SOURCE: USGS, Surficial Geologic Map of the Boston Area, Massachusetts, 1977.

Figure III.3

Surficial Geologic Map of the Area

C. Hydrology

1. Surface Water

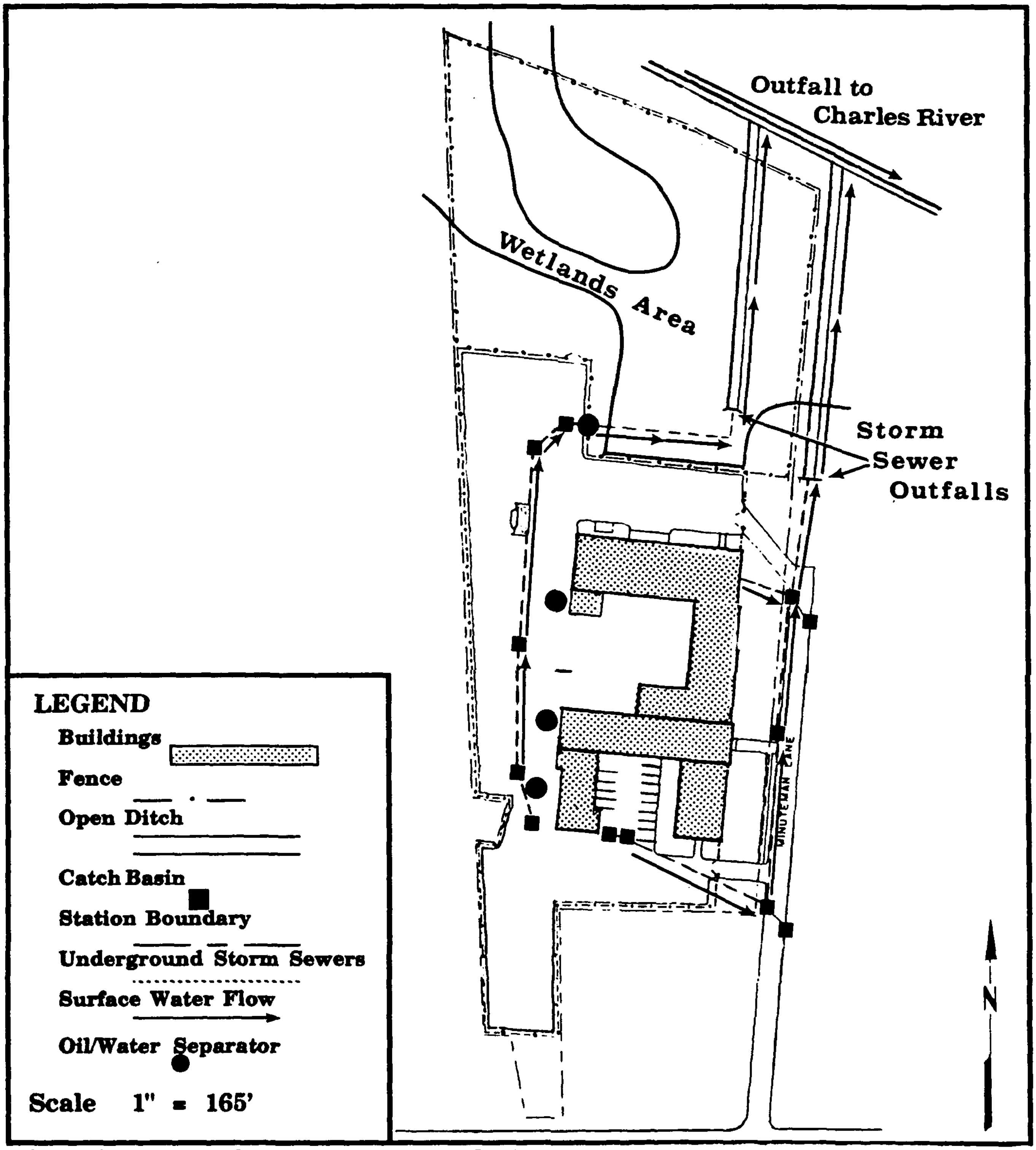
The Station is located in the Charles River drainage basin and outside the 100-year flood plain (Federal Emergency Management Agency). Surface water from the developed portion of the Station is collected by a series of storm drains (Figure III.4). Storm drains are located along the western and northwestern sides of the building to collect surface water from those areas. The water is transported north through an underground storm sewer and then east to an outflow point situated north of the building complex in the wetlands area. Before being discharged into an open ditch, the surface water passes through an oil/water separator. However, it is important to note that during periods of moderate to heavy rainfall, the drainage system backs up and floods the pavement area. Information pertaining to the flooding was obtained through interviewing station personnel. When flooding occurs, surface water is drained north to the wetlands area and transported northward in the existing ditch. Surface water from the northern part of the complex flows north into the wetlands area where it is collected in the aforementioned ditch. This ditch then transports the surface water northward through the wetlands area where it outflows the Station property along the northern boundary.

From the southern and eastern parts of the building complex, surface water is collected by storm drains associated with Minuteman Lane (Figure III.4). Water is routed east where it outflows the Station property and flows north along Minuteman Lane. At the end of Minuteman Lane, water is discharged into an open ditch where it continues northward along the northeast boundary of the Station.

Once surface water reaches the northern limits of the Station property in one or both of these ditches, it then flows eastward in an open ditch. This ditch flows eastward 0.09 miles before continuing northward under Route 128/Interstate 95, 0.07 miles into the Charles River (Figure III.5). From this point, the Charles River meanders northward and then eastward approximately 18 miles before emptying into the Boston Harbor.

2. Groundwater

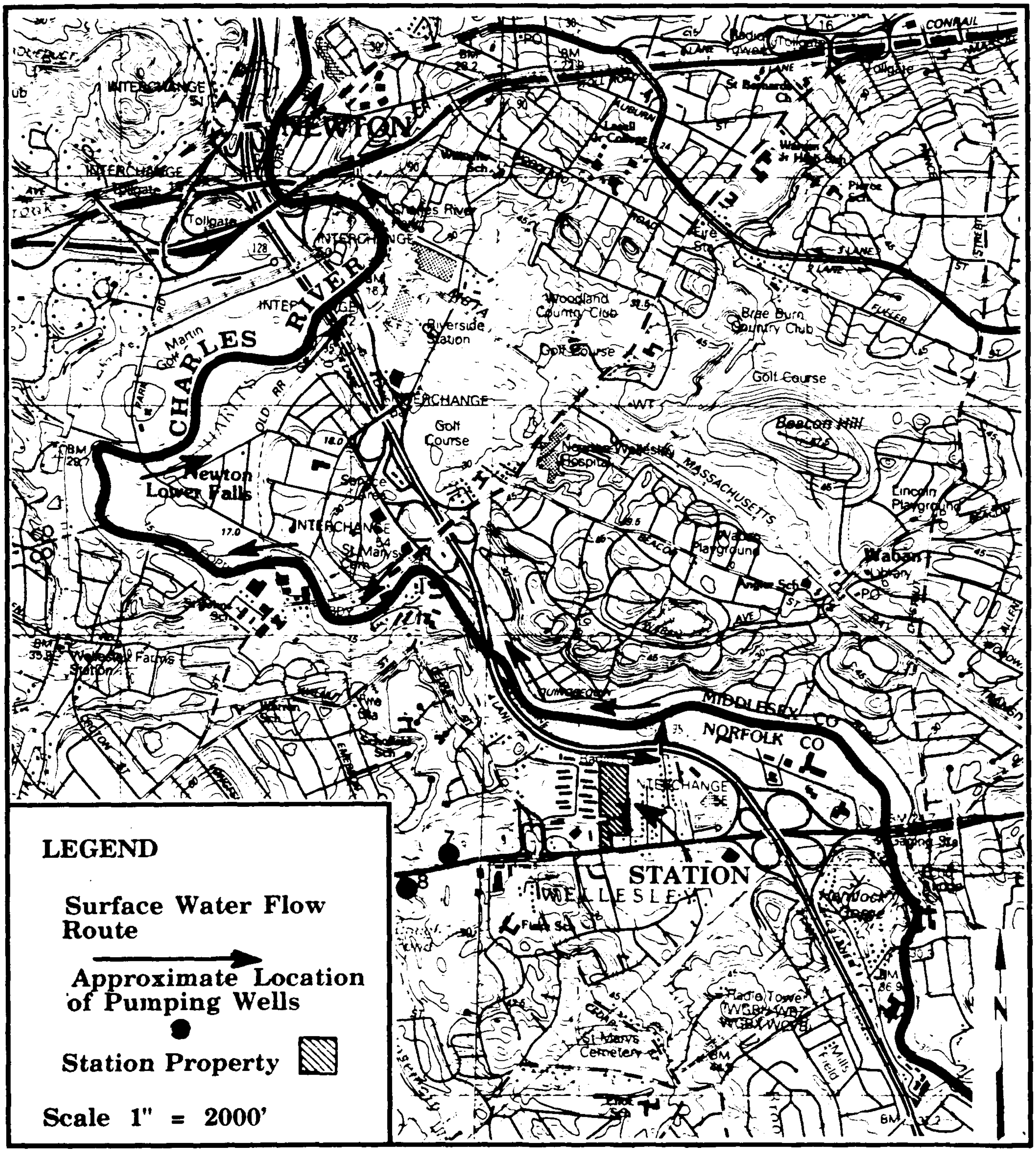
The principal aquifers of the Charles River Basin are the stratified sand and gravel deposits of glacial origin and the underlying bedrock (Walker et al, 1975). The glacial sand and gravel aquifer is of primary importance because it is capable of yielding large volumes of water necessary for public use. Bedrock is of secondary consideration because it characteristically yields small volumes of water unsuitable for public demand. However, the bedrock is an



SOURCE: Wellesley ANGS Base Plans, Drawing Wel-130-178, 1980.

Figure III.4

Drainage Map
of the Wellesley Air National Guard Station



SOURCE: USGS, So. Boston, 7.5 x 15 Minute Series (Topographic) and Natick 7.5 Minute Series (Topographic)

Figure III.5

Surface Water Flow Route Map

important aquifer as it is a major source of domestic water in rural areas. Both principal aquifers are present at the Station location.

The sand and gravel aquifer primarily occurs as stratified glacial drift deposited by water derived from melting glaciers. Deposits of the stratified glacial material occur in many scattered locations (Walker et al, 1975). Occurrence of the stratified deposits is generally limited to topographic lowlands, and the thickness varies to a great extent (Nelson, 1974). The yield capacity of the sand and gravel aquifer is determined by its thickness, particle size, and degree of particle sorting or stratification. Well-sorted, coarse-grained deposits of a thicker nature generally produce the highest yields of water. The location of the aquifer in relation to a surface body of water also affects yield capabilities. Normal recharge of the stratified glacial aquifer occurs locally through precipitation. Where a body of surface water is located in close proximity to the aquifer, recharge is enhanced by induced infiltration from the surface water body (Walker et al, 1975). Large yield capacities can be expected from the aquifer where it has an average thickness of approximately 50 feet of stratified sand and gravel and is located in reasonably close proximity to a surface water body. Wells screened from similar deposits have an average yield capacity of approximately 500 gallons per minute (GPM). It is estimated that the stratified glacial aquifer is capable of yielding 50 to 250 GPM at the Station location (Walker et al, 1975).

The stratified glacial aquifer is generally an unconfined aquifer; however, it can exist under confined conditions. Groundwater movement can be determined locally by topography. General groundwater movement is perpendicular to the surface elevation contours, and it flows toward low lying areas. Groundwater movement at the Station location likely occurs in a northerly direction toward the Charles River. However, groundwater movement can be altered on a very localized basis where large withdrawals of water from the aquifer produce a cone of depression in the potentiometric surface. In that event, flow direction would be locally toward the center of the cone. This should not be the case at the Station since no pumping wells are found in the immediate vicinity (Walker et al, 1977). The water table in the stratified glacial aquifer at the Station location is at or very near the land surface. The depth to the water table is estimated at 0 to 1 foot below the land surface.

The bedrock underlying the glacial drift will provide small quantities of water at almost any location. As an aquifer, the bedrock is significant as a domestic water source, but it does not generally yield volumes of water sufficient for public supply (Walker et al, 1975). This is attributed to the lithologic composition of the bedrock and its corresponding lack of reservoir properties. Being composed of basically nonporous and nonpermeable material, the bedrock is dependent on secondary fracturing to function as an aquifer. Fracturing is common throughout the area because of the extensive structural deformation associated with the region. However, wells are generally drilled to depths of

50 to 300 feet to encounter enough fracturing to yield 1 to 5 GPM of water (Walker et al, 1975).

The nearest active pumping wells in relation to the Station are the city of Wellesley wells #7 and #8. They are public supply wells that are located approximately 2500 feet and 3500 feet southwest of the Station, respectively. Both wells are screened in the stratified glacial aquifer and do not penetrate bedrock (Walker et al, 1977).

The susceptibility of groundwater and surface water to contamination from the Station is considered to be moderately high to high risk, should a release occur. This can be attributed to the relatively permeable nature of the soils, the underlying occurrence of the stratified glacial aquifer, and the existence of the water table at or very near the land surface. In addition, the stratified glacial aquifer is probably unconfined and is recharged locally by surface water. A major water source exists in close proximity and is the direct recipient of surface water flow from the Station.

D. Critical Habitats/Endangered or Threatened Species

According to the town of Wellesley Natural Resources Commission, no endangered or threatened species of flora or fauna have been identified within a 1-mile radius of the Station. There are also no formally designated critical habitats.

Several small wetland areas occur within a 1-mile radius of the Station. The Station was originally constructed over a wetland area, and the north portion of the Station property is a remnant of this wetland. Wetland areas also occur 1000 feet to the northeast along the Charles River, 1500 feet southeast of the Station, and 1000 feet west of the Station. In addition, wetlands are present in the vicinity of Longfellow Pond.

IV. SITE EVALUATION

A. Activity Review

A review of Station records and interviews with personnel were used to identify specific operations in which the majority of hazardous materials and/or hazardous wastes are used, stored, processed, and disposed. Table IV.1 provides a history of waste generation and disposal for operations conducted by shops at the Station. If an item is not listed on the table on a best-estimated basis, that activity or operation produces negligible (less than 1 gallon/year) waste requiring disposal.

The potable water supply and sanitary sewer service for the Station are provided by the town of Wellesley. There are no potable water wells at the Station.

B. Disposal/Spill Site Information, Evaluation, and Hazard Assessment

Six persons were interviewed to identify and locate potential sites that may have been contaminated by hazardous wastes as a result of past Station operations. No potential sites were identified.

C. Other Pertinent Facts

- Trash and non-hazardous solid wastes from the Station are disposed of by the Wellesley Trucking Service.

- The Station was built in a wetland that was a component of farm land until 1960. No building construction has been done in the north portion of the Station, which is still a wetland. In the past, local residents have discarded scrap metal and domestic solid waste in this area. One interviewee reported that adolescents had drained some motorcycle engine oil in this area, and a slight oil sheen was observed in the field. However, there is no documentary or oral evidence indicating that significant quantities of hazardous materials were ever disposed of in this area.

- The Station is not required to have a National Pollutant Discharge Elimination System (NPDES) Permit.

- Available information indicates that there have been no leaking USTs at the Station. The Station has no abandoned USTs.

Table IV.1 Hazardous Materials/Hazardous Wastes Disposal Summary: Wellesley Air National Guard Station, Wellesley, Massachusetts.

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal 1960 — 1970 — 1980 — 1990
Vehicle Maintenance (Bldg. 001)	Engine Oil	550	UNK | CONTR | DRMO
	PD-680	55	UNK | CONTR | DRMO | NLU
	Battery Acid	55	UNK | NEUT/SAN | DRMO
	Ethylene Glycol	110	UNK | EVAP/ STORM | DRMO
	Hydraulic Oil	55	UNK | CONTR | DRMO
	Transmission Oil	25	UNK | CONTR | DRMO
	Paint Thinner	55	UNK | EVAP/ TRASH | DRMO
	Paint (250 Containers)*	15	UNK | RAGS/TRASH
	Brake Fluid	25	UNK | TRASH/DRMO
	Diesel Fuel	55	UNK | CONTR | DRMO
	MOGAS (Leaded)	55	UNK | CONTR | DRMO | NLU
	MOGAS (Unleaded)	55	NIU | DRMO
	Bearing Grease	3 Lbs	UNK | CONTR/RAGS/TRASH | DRMO
	Gunk™ (Degreaser)	10	UNK | OWS/ EVAP/STORM

KEY:

CONTR - Disposed of through a contractor.
DRMO - Disposed of through the Defense Reutilization & Marketing Office. (Prior to 1986, this office was known as the Defense Property Disposal Office (DPDO).)
EVAP - Material disposed of by evaporation.
NEUT - Material neutralized with a chemical agent.
NIU - Material was not in use at this time.
NLU - Material no longer used.
OWS - Material disposed of through an oil/water separator. (OWSs were installed in 1983.)
RAGS - Material wiped onto rags.
SAN - Disposed of through the sanitary sewer.
STORM - Disposed of through the storm sewer.
TRASH - Disposed of in trash that goes to city landfill.
UNK - Disposal method is unknown.

* This quantity of containers disposed of in one year out of every four years.

Table IV.1 Hazardous Materials/Hazardous Wastes Disposal Summary: Wellesley Air National Guard Station, Wellesley, Massachusetts (continued).

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal (1960 – 1970 – 1980 – 1990)
Aerospace Ground Equipment (AGE) Maintenance (Bldg. 001)	Engine Oil	200	UNK | CONTR | DRMO
	Paint Thinner	5	UNK | NIU | DRMO
	JP-4	25	UNK | CONTR | DRMO
	PD-680	25	UNK | CONTR | DRMO | NLU
	Gunk™ (Degreaser)	15	UNK | EVAP/STORM/OWS | NLU
	7808 Oil	5	UNK | CONTR | DRMO
	Battery Acid	20	UNK | NEUT/EVAP | UNK | DRMO
	Diesel Fuel	55	UNK | EVAP/STORM/OWS | DRMO
	Aircraft Cleaning Compound	50	UNK | NIU | STORM

KEY:

CONTR - Disposed of through a contractor.
DRMO - Disposed of through the Defense Reutilization & Marketing Office. (Prior to 1986, this office was known as the Defense Property Disposal Office (DPDO).)
EVAP - Material disposed of by evaporation.
NEUT - Material neutralized with a chemical agent.
NIU - Material was not in use at this time.
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OWS - Material disposed of through an oil/water separator. (OWSs were installed in 1983.)
RAGS - Material wiped onto rags.
SAN - Disposed of through the sanitary sewer.
STORM - Disposed of through the storm sewer.
TRASH - Disposed of in trash that goes to city landfill.
UNK - Disposal method is unknown.
* This quantity of containers disposed of in one year out of every four years.

- One power utility transformer is located on the Station lease area. It is in the southeast corner of the large outdoor area partially enclosed by the wings of the Headquarters Building. This transformer is owned and maintained by the Town of Wellesley (Electric Department). The transformer, which was manufactured in 1967 and transferred to the Station from two previous, off-Station service locations, has been in service at this location since 1982. In that year, it replaced an older transformer that was in service in the same place. It is believed that the replacement was prompted by a power service upgrade.

  The transformer now in service at the Station contains 183 gallons of dielectric fluid. It has not been tested for polychlorinated biphenyls (PCBs). Interviewees at the Station did not recall any past dielectric fluid leaks or spills at this location.

  There are no capacitors in service at the Station.

- There are four OWSs at the Station. Three of these are located immediately west of the Vehicle Maintenance Shop and AGE Shop portions of the Headquarters Building. Two of these OWSs serve the Vehicle Maintenance Shop and one serves the AGE Shop. These three OWSs are connected to the sanitary sewer system. The fourth OWS is located 100 feet north of the northwest corner of the Headquarters Building. This OWS is connected to the storm sewer system and it receives storm water flow from the north side of the Station, including the area of the waste holding area.

  The three OWSs connected to the sanitary sewer system are all of the same design. These cylindrical units are four feet ten inches in diameter and eight feet ten inches in height. The OWS connected to the storm sewer system is of a different design. It is five feet square and nine feet in height. Available engineering drawings do not indicate the volumes of the waste oil holding tanks associated with these OWSs nor do they present enough data to allow confident calculation of the volumes.

  The oil levels of the waste oil holding tanks are not checked frequently. When the tanks were last checked in 1987, they were not full. When needed, a local contractor removes the waste oil.

  With respect to the OWSs connected to the sanitary sewer system. There were no reports of past malfunctions. Because of flooding from the high water table, it is suspected that the OWS connected to the storm sewer system has not functioned properly since its installation during or after 1983.

- No large spills of hazardous materials or hazardous wastes have occurred at the Station. Small spills to the pavement are cleaned up with commercially available absorbent materials.

- The waste holding area for the Vehicle Maintenance Shop and AGE Shop has been and is currently located on pavement immediately west of the Vehicle Maintenance Shop.

V. CONCLUSIONS

Information obtained through interviews with six present Station personnel, reviews of Station records, and field observations identified no contaminated disposal and/or spill sites on Station property.

VI. RECOMMENDATIONS

No further IRP investigation is recommended for the Station.

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GLOSSARY OF TERMS

ALLUVIAL - Pertaining to or composed of alluvium, or deposited by a stream of running water.

ALLUVIUM - A general term for detrital deposits made by streams on river beds, flood plains, and alluvial fans. The term applies to stream deposits of recent time.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

ANTICLINE - A fold, generally convex upward, whose core contains the stratigraphically older rocks.

AQUICLUDES - A body of rock that will absorb water slowly but will not transmit it fast enough to supply a well or spring.

AQUIFER - A body of rock that is sufficiently permeable to conduct groundwater and yield economically significant quantities of water to wells and springs.

ARGILLACEOUS - Like or containing clay.

ARTESIAN AQUIFER - A water-bearing bed that contains water under hydrostatic pressure.

BASIN - (a) A depressed area with no surface outlet; (b) A drainage basin or river basin; (c) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated.

BAY - A wide, curving open indentation, recess, or inlet of a sea or lake into the land or between two capes or headlands, larger than a cove, and usually smaller than, but of the same general character as a gulf.

BED [stratig] - The smallest formal unit in the hierarchy of lithostratigraphic units. In a stratified sequence of rocks, it is distinguishable from layers above and below. A bed commonly ranges in thickness from a centimeter to a few meters.

BEDDING [stratig] - The arrangement of sedimentary rock in beds or layers of varying thickness and character.

BEDROCK - A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

BOULDER - A detached rock mass larger than a cobble, having a diameter greater than 256 mm, being somewhat rounded or otherwise distinctly shaped by abrasion in the course of transport.

CALCAREOUS - Containing calcium carbonate.

CLAY [geol] - A rock or mineral fragment or a detrital particle of any composition smaller than a fine silt grain, having a diameter less than 1/256 mm (4 microns).

CLAY [soil] - A rock or mineral particle in the soil having a diameter less than 0.002 mm (2 microns).

COARSE-GRAINED - 1. Said of a crystalline rock, and of its texture, in which the individual minerals are relatively large, e.g. an igneous rock whose particles have an average diameter greater than 5 mm (0.2 inc.) 2. Said of a sedimentary rock, and of its texture, in which the individual constituents are easily seen with the unaided eye, i.e. have an average diameter greater than 2 mm (0.08 in.)

COARSE-TEXTURED - (light textured) SOIL - Sand or loamy sand.

COBBLE - A rock fragment between 64 and 256 mm in diameter, thus larger than a pebble and smaller than a boulder, rounded or otherwise abraded in the course of aqueous, eolian, or glacial transport.

CONE OF DEPRESSION - The depression of heads around a pumping well caused by the withdrawal of water.

CONFINED AQUIFER - An aquifer bounded above and below by impermeable beds, or by beds of distinctly lower permeability than that of the aquifer itself.

CONGLOMERATE - A coarse-grained sedimentary rock, composed of rounded pebbles, cobbles, and boulders, set in a fine-grained matrix of sand or silt, and commonly cemented by calcium carbonate, iron oxide, silica, or hardened clay.

CONSOLIDATION - Any process whereby loosely aggregated, soft, or liquid earth materials become firm and coherent rock; specif. the solidification of a magma to form an igneous rock, or the lithification of loose sediments to form a sedimentary rock.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

CUESTA - An asymmetrical ridge, with a long, gentle slope on one side conforming with the dip of the underlying strata, and a steep or clifflike face on the other side formed by the outcrop of the resistant beds.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DIP - The angle that a stratum or any planar feature makes with the horizontal, measured perpendicular to strike and in the vertical plane.

DOLOMITE - A sedimentary rock consisting of calcium magnesium carbonate, $CaMg(Co_3)_2$. Occurs in beds formed by the alteration of limestone.

DRAINAGE CLASS (natural) - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

> *Excessively drained* - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
>
> *Somewhat excessively drained* - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
>
> *Well-drained* - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well-drained soils are commonly medium textured. They are mainly free of mottling.
>
> *Moderately well drained* - Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

DRAINAGEWAY - A channel or course along which water moves in draining an area.

DRUMLIN - A low, smoothly rounded, elongate hill of compact glacial till, or rarely other kinds of drift, built under the margin of the ice and shaped by its flow, or carved out of an older moraine by readvancing ice; its longer axis is parallel to the direction of movement of the ice.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the Class Insecta determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

EROSION - The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies, but usually exclude mass wasting.

ESCARPMENT - A long, more or less continuous cliff or relatively steep slope facing in one general direction, separating two level or gently sloping surfaces, and produced by erosion or faulting.

FAULT - A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

FELDSPAR - Any of several crystalline minerals made up of Aluminum silicates with sodium, potassium, or calcium, usually glassy and moderately hard, found in igneous rocks.

FERRUGINOUS - Pertaining to or containing iron.

FINE-GRAINED - 1. Said of an igneous rock, and its texture, whose particles have an average diameter less than 1 mm (0.04 in.) 2. Said of a sedimentary rock, and of its texture, in which the particles have an average diameter less than 1/16 mm (62 microns, or silt size and smaller).

FINE-TEXTURED (heavy textured) SOIL - Sandy clay, silty clay, and clay.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FOLD [geol struc] - A curve or bend of a planar structure such as rock strata, bedding planes, foliation or cleavage.

FORMATION - A lithologically distinctive, mappable body of rock.

FOSSILIFEROUS - Containing fossils.

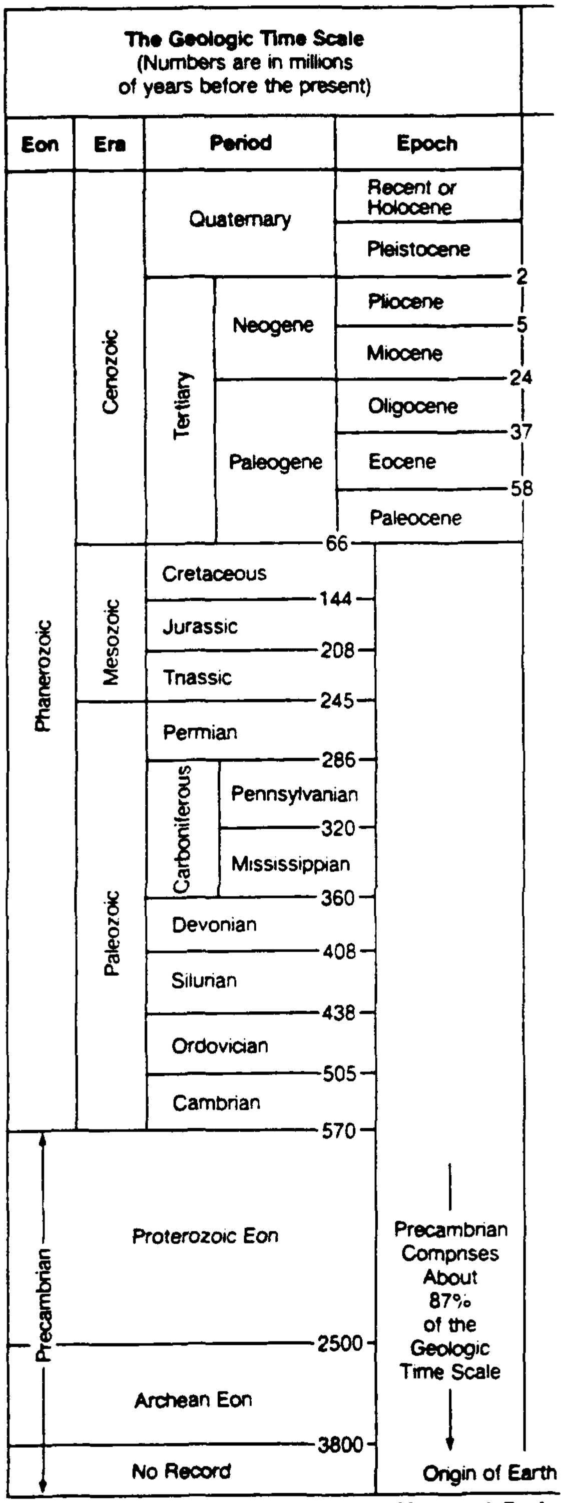
FRACTURE [struc geol] - A general term for any break in a rock, whether or not it causes displacement, due to mechanical failure by stress. Fracture includes cracks, joints, and faults.

GEOLOGIC TIME - See Figure Gl.1.

GLACIAL - (a) of or relating to the presence and activities of ice or glaciers, (b) Pertaining to distinctive features and materials produced or derived from glaciers and ice sheets.

GLACIAL DRIFT - A general term for drift transported by glaciers or icebergs and deposited on land or in the sea.

GLACIAL TILL - Unstratified drift, deposited directly by a glacier without reworking by meltwater and consisting of a mixture of clay, silt, sand, gravel, and boulders ranging widely in size and shape.



SOURCE: Wicander, R. and J. S. Monroe, Historical Geology Evolution of the Earth and Life Through Time, 1989.

Figure Gl.1

The Geologic Time Scale

GLAUCONITIC SANDSTONE - greensand, composed of a green mineral, closely related to the micas and essentially a hydrous potassium iron silicate.

GRANITE - Broadly applied, any crystalline, quartz-bearing plutonic rock; also commonly contains feldspar, mica, hornblende, or pyroxene.

GRANODIORITE - A group of coarse-grained plutonic rocks intermediate in composition between quartz diorite and quartz monzonite, containing quartz, plagioclase, and potassium feldspar with biotite, hornblende, or more rarely, pyroxene, as the mafic contents.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HAS - Hazard Assessment Score - The score developed by using the Hazard Assessment Rating Methodology.

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HERBICIDE - A weed killer.

HILL - A natural elevation of the land surface, rising rather prominently above the surrounding land, usually of limited extent and having a well-defined outline (rounded) and generally considered to be less than 1000 feet from base to summit.

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from magma.

INTERBEDDED - Beds lying between or alternating with others of different character; especially rock material laid down in sequence between other beds.

KAME - A mound, knob, or short irregular ridge, composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a superglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

LACUSTRINE - Pertaining to, produced by, or inhabiting a lake or lakes.

LIMESTONE - A sedimentary rock consisting of the mineral calcite (calcium carbonate, $CaCO_3$) with or without magnesium carbonate.

LIMONITE - A common secondary material, formed by weathering (oxidation) of iron-bearing materials.

LITHOLOGY - (a) The description of rocks. (b) The physical character of a rock.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal proportions of sand, silt, and clay particles, and usually containing organic matter.

MEAN LAKE EVAPORATION - The total evaporation amount for a particular area; amount based on precipitation and climate (humidity).

MEDIUM-GRAINED - 1. Said of an igneous rock, and of its texture, in which the individual crystals have an average diameter in the range of 1-5 mm (0.04 - 0.2 in.) 2. Said of a sedimentary rock, and of its texture, in which the individual particles have an average diameter in the range of 1/16 to 2 mm (62-2000 microns, or sand size).

METAMORPHIC ROCK - Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the Earth's crust.

MIGRATION [Contaminant] - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

MINERAL - A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form and physical properties.

MORAINE - A mound or ridge of unstratified glacial drift, chiefly till, deposited by direct action of glacier ice.

NET PRECIPITATION - Precipitation minus evaporation.

NORMAL FAULT - A fault in which the hanging wall appears to have moved downward relative to the footwall. The angle of dip is usually 45° - 90°.

OUTCROP - That part of a geologic formation or structure that appears at the surface of the Earth.

OUTWASH [glac geol] - A stratified detritus (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of an active glacier.

OUTWASH PLAIN - a broad, gently sloping sheet of outwash deposited by meltwater streams flowing in front of or beyond a glacier, and formed by coalescing outwash fans.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment by the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

POND - A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger then a pool.

POROSITY - The ratio of the aggregate volume of interstices in a rock or soil to its total volume.

POTENTIOMETRIC SURFACE - An imaginary surface representing the total head of groundwater and defined by the level to which water will rise in a well. The water table is a particular potentiometric surface.

QUARTZ - A crystalline silica, an important rock forming mineral: SiO_2. Occurs either in transparent hexagonal crystals (colorless or colored by impurities) or in crystalline. Forms the major proportion of most sands and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

RECHARGE - The processes involved in the addition of water to the zone of saturation; also, the amount of water added.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SANDSTONE - A medium-grained fragmented sedimentary rock composed of abundant round or angular sand fragments set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbonate).

SANDY LOAM - A soil containing 43 - 85% sand, 0 - 50% silt, and 0 - 20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30% or containing 43 - 52% sand, less than 50% silt, and less than 7% clay.

SCHIST - A medium- or coarse-grained, strongly foliated, crystalline rock; formed by dynamic metamorphism.

SEDIMENTARY ROCK - A rock resulting from the consolidation of loose sediment that has accumulated in layers; e.g., a clastic rock (such as conglomerate or tillite) consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; or a chemical rock (such as rock salt or gypsum) formed by precipitation from solution; or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals.

SHALE - A fine-grained detrital sedimentary rock, formed by the consolidation (especially by compression) of clay, silt, or mud.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SILT LOAM - A soil containing 50 - 88% silt, 0 - 27% clay and 0 - 50% sand.

SILTSTONE - An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

SLATE - A compact, fine-grained metamorphic rock that possesses slaty cleavage and hence can be split into slabs and thin plates. Most slate was formed from shale.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as the distance per unit time that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	- less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	- 0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	- 0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)
Moderate	- 0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)
Moderately Rapid	- 2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)
Rapid	- 6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)
Very Rapid	- more than 20.00 inches per hour (more than 1.41×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Conservation Service)

SOLVENT - A substance, generally a liquid, capable of dissolving other substances.

SORTED - Said of a sediment or detrital rock consisting of uniform size of lying within the limits of a single grade.

STRATIFIED - Formed, arranged, or laid down in layers or strata; especially said of any layered sedimentary rock or deposit.

STRATIGRAPHIC UNIT - A body of strata recognized as a unit for description, mapping, or correlation.

STRIKE - The direction taken by a structural surface, e.g., a bedding or fault plane, as it intersects the horizontal.

STRUCTURAL - Of or pertaining to rock deformation or to features that result from it.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

SWAMP - An area intermittently or permanently covered with water, having shrubs and trees but essentially without the accumulation of peat.

TECTONIC - Pertaining to the forces involved in, or the resulting structures of, tectonics.

TECTONICS - A branch of geology dealing with the broad architecture of the outer part of the earth, that is, the major structural or deformational features and their relations, origin, and historical evolution.

TERRACE [geomorph] - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or significant portion of its range.

THRUST FAULT - A fault with a dip of 45° or less over much of its extent, on which the hanging wall appears to have moved upward relative to the footwall. Horizontal compression rather than vertical displacement is its characteristic feature.

TILL - Dominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand and gravel and boulders ranging widely in size and shape.

TIME [Geologic] - See Figure Gl.1.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and man-made features.

UNCONSOLIDATED - (a) Sediment that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth. (b) Soil material that is in a loosely aggregated form.

VALLEY - Any low-lying land bordered by higher ground, especially an elongate, relatively large, gently sloping depression of the earth's surface, commonly situated between two mountains or between ranges of hills and

mountains, and often containing a stream or river with an outlet. It is usually developed by stream or river erosion, but can be formed by faulting.

VOLCANIC - Pertaining to the activities, structures, or rock types of a volcano.

WATER TABLE - The upper limit of the portion of the ground that is wholly saturated with water; the surface on which the fluid pressure in the pores of a porous medium is exactly atmospheric.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

Appendix A

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1) Commonwealth of Massachusetts
Department of Environmental Management
Flood Control and Well Drillers Program
100 Cambridge Street
Room 1304
Boston, Massachusetts 02202
Thomas Klock
(617) 727-3267

2) Commonwealth of Massachusetts
Department of Environmental Management
100 Cambridge Street, 19th Floor
Boston, Massachusetts 02202
Bill Bones and Vicki Epstein
(617) 727-3267

3) Commonwealth of Massachusetts
Department of Environmental Protection
Bureau of Waste Prevention
1 Winter Street
Boston, Massachusetts 02108
Nancy Wrenn
(617) 292-5587

4) Commonwealth of Massachusetts
Department of Environmental Quality Engineering
State Geologist
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202
Joseph A. Sinnott
(617) 727-9800 Ext. 213

5) 102 FIW/DE
Building 971
Otis Air National Guard Base, Massachusetts 02542-5001
Bill Sterling
(508) 968-4438

OUTSIDE AGENCY CONTACT LIST (continued)

6) Town of Wellesley
Department of Public Works
Engineering Division
455 Worcester Street
Wellesley Hills, Massachusetts 02181
Douglas R. Stewart
(617) 235-7600

7) Town of Wellesley
Department of Public Works
Water Division
455 Worcester Street
Wellesley Hills, Massachusetts 02181
Joseph B. Duggan
(617) 235-7600

8) Town of Wellesley
Electric Devision
P.O. Box 364
455 Worcester Street
Wellesley Hills, Massachusetts 02181
Charles Vansant
(617) 235-7600

9) Town of Wellesley
Natural Resources Commission
Town Hall
Wellesley, Massachusetts 02181
Priscilla Ryder
(617) 431-1019

10) Town of Wellesley
Planning Board
Town Hall
Wellesley, Massachusetts 02181
Richard H. Brown
(617) 431-1019

11) United States Department of Agriculture
Soil Conservation Service
460 Main Street
Walpole, Massachusetts 02081
Mark DeBrock
(617) 668-1170

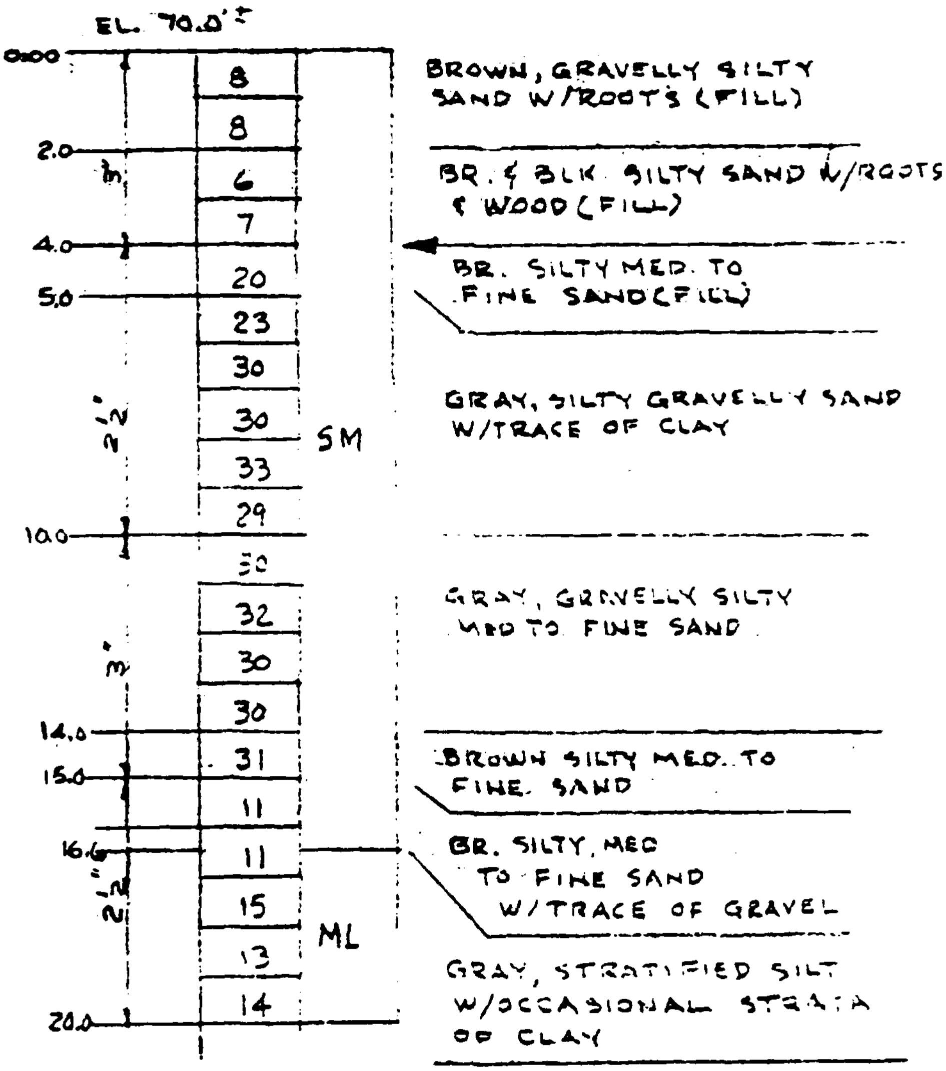
OUTSIDE AGENCY CONTACT LIST (continued)

12) United States Geological Survey
Massachusetts Office - Water Resources Division
28 Lord Road, Suite 280
Marlborough, Massachusetts 01752
Michael H. Frimpter
(508) 485-6360

13) United States Geological Survey
New England District Headquarters
Water Resources Division
10 Causeway Street, Room 926
Boston, Massachusetts 02222
David McCartney
(617) 565-6860

Appendix B

Soil Borings at the Station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SM
ML
BROWN, GRAVELLY SILTY SAND W/ROOTS (FILL)
BR. & BLK. SILTY SAND W/ROOTS & WOOD (FILL)
BR. SILTY MED. TO FINE SAND (FILL)
GRAY, SILTY GRAVELLY SAND W/TRACE OF CLAY
GRAY, GRAVELLY SILTY MED TO FINE SAND
BROWN SILTY MED. TO FINE SAND
BR. SILTY, MED TO FINE SAND W/TRACE OF GRAVEL
GRAY, STRATIFIED SILT W/OCCASIONAL STRATA OF CLAY

FD-6

28 MAY 64

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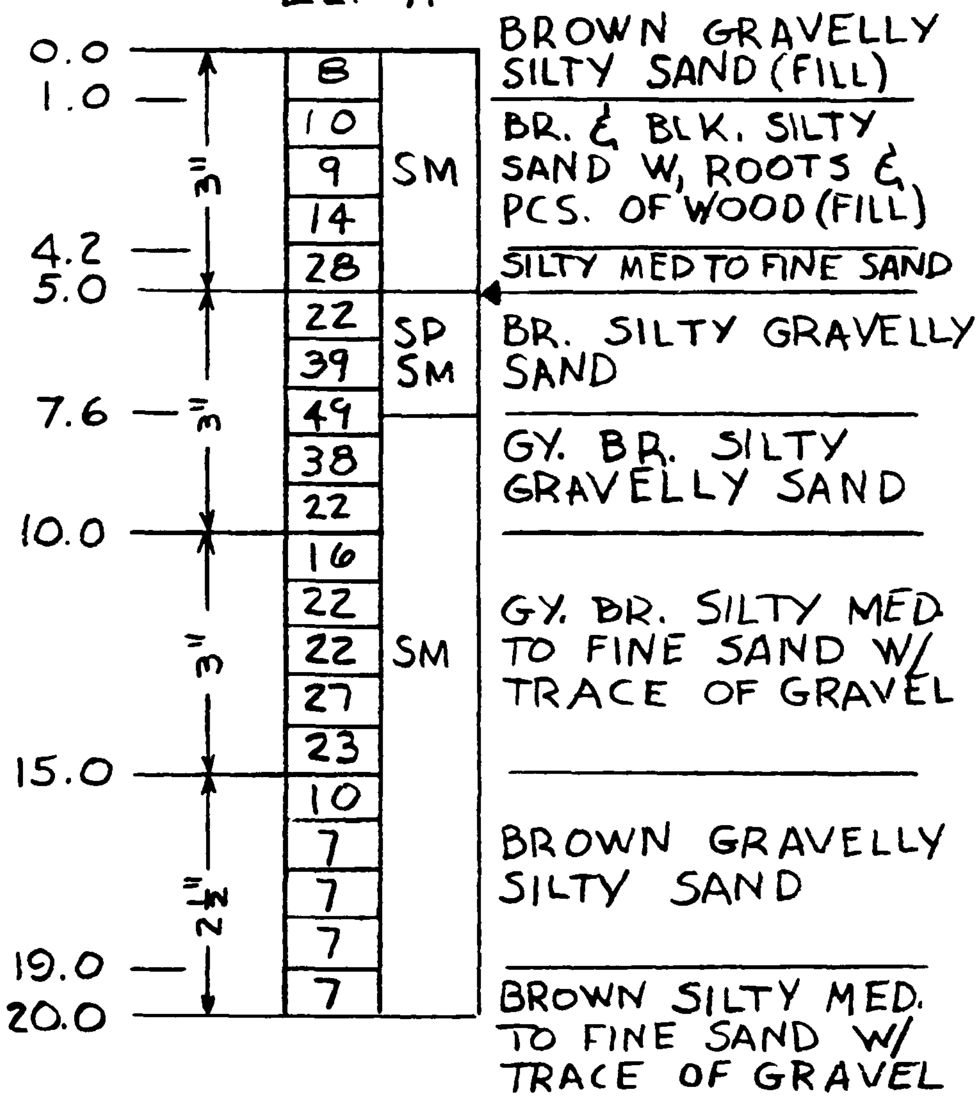

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29 MAY 64

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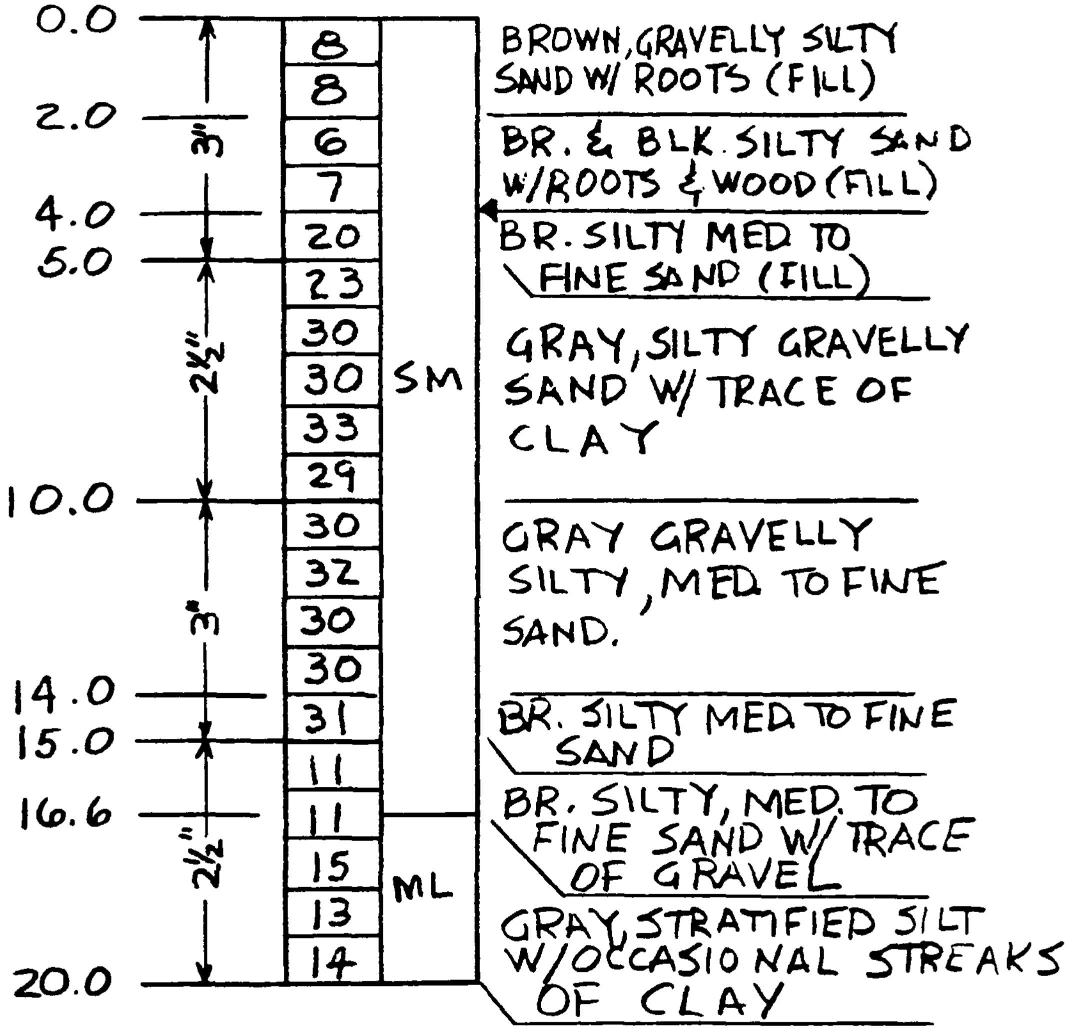

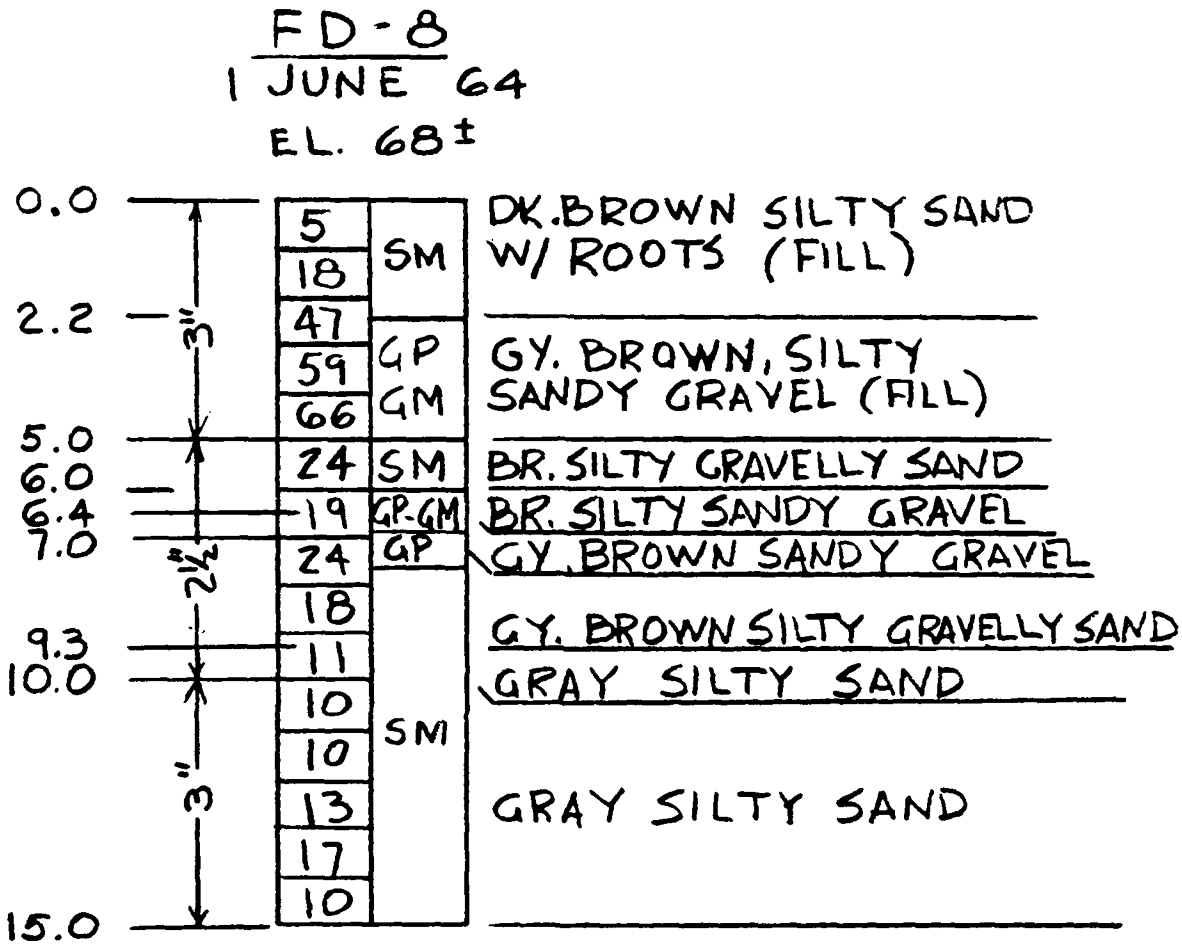
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DK. BROWN SILTY SAND W/ ROOTS (FILL)
GY. BROWN, SILTY SANDY GRAVEL (FILL)
BR. SILTY GRAVELLY SAND
BR. SILTY SANDY GRAVEL
GY. BROWN SANDY GRAVEL
GY. BROWN SILTY GRAVELLY SAND
GRAY SILTY SAND
GRAY SILTY SAND